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ABSTRACT

In 1984 an evaluation team examined the Maryland Functional Testing Program (MFTP), a statewide competency-based, criterion-referenced testing program that was instituted to limit awarding of high school diplomas to those students who had earned scores above cut scores on a series of achievement tests. This article examines the procedures the state followed to ostensibly improve student attainment and compares them to the steps that an instructional system design/development model of instructional problem solution would require. It concludes that little worthwhile improvement in basic skills learning can be attributed to the testing and its associated curriculum augmentation programs. Effective procedures to improve instruction are described in a checklist manner by comparing Maryland's procedures with those required by the instructional systems development models. (Author/JAZ)

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A COMPETENCY-BASED TESTING PROGRAM PROGRAM EVALUATION FROM AN INSTRUCTIONAL DESIGN POINT OF VIEW

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ABSTRACT

An evaluation team examined a statewide competency-based, criterion referenced testing program that was instituted to limit awarding of high school diplomas to those students who had earned scores above cut scores on a series of achievement tests. This article examines the procedures the state followed to ostensibly improve student attainment and compares them to the steps that an instructional system design/development model of instructional problem solution would require. It concludes that little worthwhile improvement in basic skills learning can be attributed to the testing and its associated curriculum augmentation programs. Effective procedures to improve instruction are described.

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A COMPETENCY-BASED TESTING PROGRAM EVALUATION FROM AN INSTRUCTIONAL DESIGN POINT OF VIEW

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Introduction: The State of Maryland began a competency-based testing program in 1979. In order to obtain a high school diploma from a public high school in the State, a candidate for graduation must pass an array of achievement tests in various subjects. The tests in question were designed and developed under the direction of an office in the Maryland State Department of Education (MSDE) known as the Program Assessment Branch (PAB).

The test design and development, procedures for administration and scoring, and analysis of scores are all the responsibility of the PAB. In 1984, the PAB employed the services of the Center for Educational Research and Development at the University of Maryland Baltimore County (UMBC) and also the consultative service of three nationally recognized experts in testing and evaluation. They were asked to appraise the Maryland Functional Testing Program (MFTP) which is the name for the competency achievement testing program. In particular, the State testing officials wanted to know how closely the program meets the best available standards of educational and psychological measurement. After six months of intense work, the researchers produced a comprehensive report for PAB that assessed the extent to which the program met an appropriate subset of the Joint Technical Standards for Educational & Psychological Testing (JTS). (American Educational Research Association, et al, 1985).

In addition to writing this paper I organized a symposium for presentation of the process by which such an evaluation of a large scale testing program took place. Other papers dealt with the history of the project, how closely the evaluation met the stated needs of the State, and how well the Rasch model of test analysis worked. Although I spent my time on the actual evaluation comparing the procedures that PAB followed with the selected JTS standards, I will focus on a different problem here.

I will try to present my perspective on how the work the MSDE Program Assessment Branch did on the Maryland Functional Testing Program (MFTP) is likely to effect efforts to improve school achievement in Maryland public schools. I present this discussion in a check list manner by comparing the State's procedures with those required by the instructional systems development model (ISD).

The term ISD may be unfamiliar to educators who work only in and around school settings. A brief definition is therefore in order. ISD is the practice of trying to solve a problem through scientifically designed instruction. The problem must be susceptible to solution through the application of the concepts and devices of educational psychology and technology. Design and development of instructional modules, lessons, or courses can call upon a great variety of skills, techniques, and devices. But, the distinguishing characteristic of ISD is the style of the designer-developer team. They invariably spend great blocks of time and energy in problem definition and clarification. The usual setting

for such workers is non-school because, I believe, ISD is still unknown among school people and frightens potential users by some of the technical jargon and what seem to be exorbitant costs.

If the State of Maryland had recognized a serious instructional problem and wanted sincerely to solve it, then it should have provided enough energy, adequate resources, and sufficient intelligence to solve it and to serve well the needs of its citizens. I maintain and will demonstrate that the scientific approach was missing and therefore the problem has not been solved and most likely continues to exist. Another problem may have been solved but, in my opinion, the young people who will receive Maryland high school diplomas from now on under the newly-mandated competency based testing program will be indistinguishable from their predecessors. Or, to be more precise, if they are different, no one will be able to tell how much credit the competency based testing program deserves for the change. Ten years from now people will still be complaining about recent high school graduates. In short, the State is not getting what many think it was bargaining for. The reason is that the program was developed in a climate oblivious to or disinterested in the principles of ISD.

I know that we are in a political rather than a competitive commercial environment. In a sense so are the armed services but much of the knowledge on the science of instruction we have today came from war-time efforts of psychologists like Robert Gagne and John Flanagan to name only two. It is true that a democratic state cannot move ahead and suddenly establish a centralized ministry of schools. The American tradition and form of government does not permit such action and the educational needs of the state in question are not so poorly met as to justify so extreme a move. The point I do wish to make is that whether the fine efforts of the many people involved will impact on Maryland high school diploma winners the way they expect will never be demonstrable. The reasons why I hold this position will be plain very soon.

I will run quickly through the 9 principal stages of design and development a journeyman ISD professional follows. Their number and names vary from place-to-place and among practitioners, but these constitute the main list, more or less. The ISD professional invariably will produce:

1. principal stages of design and development
a journeyman ISD professional follows. Their number and names vary from place-to-place and among practitioners, but these constitute the main list, more or less. The ISD professional invariably will produce:

1. *A clear problem or symptom definition.*
2. *A needs analysis that stipulates the differences between the current client behavior and the required behavior.*
3. *A list of specifications of learning objectives in behavioral terms - i.e. what the clients will be able to do after and as the consequences of the designed instruction.*
4. *A survey of existing materials that looks for existing means to solve the present problem - i.e. don't reinvent the wheel.*

5. *Well designed and developed instructional materials to be used in the actual instruction (assuming the search in the last stage produced nothing useable).*

6. *The assessment instruments - sometimes this is called the evaluation system - by whatever name we call it this most crucial part of an instructional design is needed in order to refine and remove the flaws from the instructional product, (this incidentally, should have been the function of the testing program that is the subject of this symposium).*
7. *A formative evaluation and revision of the product as indicated - you must use a sample from the targetted population of clients for this, not merely the opinions of interested parties.*
8. *The revised, re-tested and proved product, ready for installation and use, and then, finally,*
9. *A field test of the product. If major flaws emerge, one must try to determine what went wrong and if possible, revise either the product or its application.*

In a nutshell, the main characteristic of ISD is that it is the engineering approach carried to instruction and one step further. If the product (learner behavior) fails to meet the specified goals set in stage 3 above, then the team must find the instructional flaw and fix it. ISD never blames the client or the institution.

Now let us compare the history of the Maryland Functional Testing Program (MFTP) to this list of activities. We shall look for differences between ISD stages and the MFTP procedures. I want to point out, however that the Program Assessment Branch for whom we did this review was not the agency that decided to use the MFTP as the tool to improve competence among Maryland high school graduates. For that we must credit the State legislature and their surrogates, the State Board of Education. Also, let it be noted, the Joint Technical Standards that we used in appraising the testing program in 1984 did not exist when the staff at PAB were doing their work in the years starting with 1977.

First, no one had ever decided whether the problem could be solved through instructional or testing procedures. The problem statement was, as usual, deliberately vague which is true whenever learning is to be legislated (Wise, 1979). The nation was in an era of media attention to alleged school decline as provoked by exaggerated stories about test score declines everywhere (Austin & Garber, 1982), failed remediation title programs, and to a flood tide of welfare and food stamp recipients. Complaints to legislators usually by un-named, uncounted, constituents in many states were met by reflexive though unreflective answers: deny diplomas to high school pupils who are "incompetent" in the basic skills. At least any carping citizens won't be able to claim the diploma goes to the undeserving. Diverting responsibility from the agency that is designated to provide instruction, is an astute juggling act. Now the public funds that must continue to flow to these agencies will no longer allow a small number of nonteachables to make the schooling bureaucracy look bad along with the legislature that approves their financing from state tax proceeds. But will instructional improvement take place? Probably not. Maybe the educationally right solution lies in changing economic incentives for employers who will hire the underemployed, better employee selection and placement, and improved workplace training and supervision. All of these could be legislated and all are educational methods but only the latter two require instructional design and development but not necessarily in the schools.

At any rate, the State acted as if it knew the problem were one amenable to instructional solution in the public schools. It began to try to find a solution with laws and regulations demanding the school districts plan curricular reform by stating goals and the means for reaching them. This was the

accountability program and it was supplemented by a state level office for curriculum design and dissemination called Project Basic. This was an effort to insure that pupils would be taught the so-called basic or functional skills by providing "Instructional Guides" in the three R's to elementary school teachers. Standardized, uniform testing throughout the State would provide evaluations of how effective the local schools & MSDE efforts had been. Soon, officials noticed, however, that the commercial tests failed to match adequately the content in the Basic curricula since they were oriented to satisfying a broad, general, nationwide perception of pupil academic needs rather than an adult citizen's notion in Maryland of what it takes to get along in society as reflected in a lengthy list of somewhat refined objectives. Therefore, it was seen that a special testing program like the MFTP needed to be created.

Something else now insinuated itself into the schooling and testing equation. The set of contingencies was shifted, abruptly, from the local education agency (LEA) to the individual client, the pupil. ISD procedures never permit that sort of target change. Jaeger and Tittle's excellent book (1980) on minimum competency testing and Jaeger's chapter in the Austin and Garber book (1982) will give provocative insights into the details on how the states had formed new relationships with their LEA's. I think that one can appreciate that the public schools exist in a political not a scientific context. ISD professionals can recognize that stage one requirements are still incomplete. The problem symptoms and clear definitions have yet to be written down.

Now for stage 2, which I will for brevity combine with stage 3. These are the needs analysis and specification of learning objectives. The ISD team spends nearly as much time on this as on product design and development itself. It is essential to set down precisely what the client-learners cannot now do that they must be able to do later in order to meet the criterion i.e., perform in such a manner as to remove the original problem-causing condition. The educational jargon in current use would say they will attain the status of masters. The problem in Maryland was never clearly defined therefore it is impossible to expect anyone to produce documentation for stages 2 and 3. Instead, what happened was that education department professionals, LEA people, and selected laymen negotiated together and produced descriptions of functional competencies. Sufficient attention was paid to the fact that non-educators played major roles in providing an impressively huge inventory of tasks that they as adults need to perform at some time in their daily lives in order to maintain some independence. Such a list has formidable face validity! It is also exceedingly long.

But no one asked those same informants how and where they acquired those abilities nor where and how they would learn the ones they will need next week and next year. Surely they will not run down to the local high school to learn how to prepare the revised income tax return when it appears. Indeed, if tax laws continue to grow in complexity, none of the teachers who might have the skills to help will be at school. They'll be at a tax preparation office as either worker or client. In other words, minute, specific, context-defined competencies are learned only when needed and almost always are learned on the run right where they impinge on the learner. The public schools cannot and ought not to be expected to teach all the world's minutia. There is too much of it and it continues to spill out every moment from its varied sources. The activities of assembling competencies as described here is an instance not of ISD but some other rather cosmetic type of exercise. John Dewey's little book

called School and Society (1915,) is over 70 years old now. It continues to be the best text for finding out what elementary and secondary education ought to be for and what methods of instruction should look like. He also makes the point I made a moment ago about how a free intelligence deals with situationally-determined problems. He used the term mental discipline to describe this ability to use our minds to both solve problems and become better at problem solving from a well-directed effort. Sad to say, a profound lack of respect for human problem-solving potential by America's school youth underlies the wide-spread minimal competency testing movement that we witness today.

To sum up, I can find no scientific rationale for surveying thousands of laymen in order to find out what high school seniors need to learn. An ISD team would survey the sample of the people who are in the best position to know two things: 1. what the problem really is and, 2. who the people are who can analyze the problem and provide specific, appropriate, and effective behavioral objectives for the defined learner population. Lay people are notoriously unaware of how they or anyone else acquired the skills and knowledge they use every day. As sources of useful data for ISD they leave much to be desired.

When our ISD team gets to the 4th stage they might be surprised at how rich a literature exists that "appears" aimed at solving the presented problem. Unfortunately, their hopes are unfounded. They will find that many lessons, texts, even computer-based modules exist that claim to enable learners of all sorts to gain skills in many of the competencies in the Declared Competencies Index (DCI) developed by Project Basic. However, they will turn out to be fragmented, disarrayed, and dependent on conflicting methods of presentation and types of settings. Worse yet, these instructional materials will often be cast in the wrong terminology. Quarrels over the precise meaning of the words in the reading, writing, and even the mathematics curriculum guides and handbooks will be sure to break out. Another major obstacle will arise when the ISD team tries to match the instructional materials to DCI items. The DCI list is the analogy of the learning objectives that would have been produced in an ISD situation. This list is unique to the state of Maryland and no other exactly like it exists anywhere else. That is to be expected. The project is so exaggerated in ambition and scope as to be unattainable on those grounds alone. Even though many of its entries appear on other lists of objectives the overlap will be only partial and will be unclear due to vagueness induced by political necessity and the idiosyncrasies of the particular participants who produced each such list. Once again we are haunted by the ghost of the ill-defined original problem: The one that grew out of press reports about plunging SAT scores, of 25% American illiteracy, and of general decline in the schools issued by blue ribbon commissions. Because of these definitial and other problems, the fourth ISD stage was not used to help make Maryland youth better school achievers or more competent adults.

Stage 5 requires us to produce actual instructional materials. These will be designed to present selected stimuli in a precisely prescribed sequence and manner to learners of well-defined and described characteristics. The stimuili will be presented by media appropriate to each objective and learner characteristic constrained only by technological and economic considerations. Text books, cinematic and still films, programmed texts, field trips, simulations in miniature or full scale, computer-based modules with and without video disc, and live lecturers are only some of the media and methods that might be part of the design specifications. A monitoring system that uses real-time data from learner responses to control the sequencing of material for optimal learning by

each pupil can be integrated within the more elaborate systems. This strategy, by the way, was invented a very long time ago. It is sometimes called tutoring and other names and is the system used by mothers all over the world down through the centuries to teach their languages to their children. Computer-based systems use it too, but try to substitute courseware and electronic devices for the live tutor. The basic instructional strategy need not be new. It only has to be good!

As we examine the MFTP and Project Basic efforts for evidence of a set of instructional materials to see if they meet ISD standards we detect a major problem. Few people know what instruction actually takes place in each Maryland public school classroom. Lesson plans, texts, films, teachers, computer modules, and other media and materials are presented by each teacher individually. I believe we can assume that no two class sessions in the state intended to prepare pupils to meet any of the DCI outcomes will be identical. They will instead, vary from teacher to teacher, school to school, and even day to day or hour to hour for the same teacher. The instructional guides, are excellent products. However, they are intended as resources for teachers; not teaching materials to be given to learners. What goes on between the classroom teacher, the guides, and the real live pupils is something that the State and its professional staff can only speculate about. The ISD team would know with precision what was presented and under what circumstances and, with what consequences. If those consequences were below expectation, the designer of the system would change it. Not the learners directly; the system.

Project Basic and PAB staff members have no way of knowing nor any direct responsibility for what happens in Maryland schools under the name of instruction. Therefore, even if our ISD audit trail had found successful accomplishments in each of the previous stages it would detect a breakdown here in stage 5. Neither PAB or Project Basic are allowed, let alone required, to develop and produce the sets of planned activities and instructional materials that are intended to bring about some specified behavioral changes in the client population. All they do is produce curriculum materials that schools <u>may</u> use as they see fit and a testing program that high school diploma candidates must pass as a condition for diploma award. This violates the principle of designer responsibility for learning outcomes.

Now, at last, we come to stage 6, the assessment system part of an ISD project. This is the part that was the focus of this review project. If the MFTP had been part of an ISD project the criterion referenced tests designed and developed with such great care would be in nearly continual use in the Maryland schools. As pupils failed to answer correctly some specific items, that information would be relayed to the people responsible for diagnosing and revising instructional system faults. We can assume that the test items would have been validated before they were permitted to serve this function. They would have been tested, the items that is, by being tried out on pupils who were certified as competent in the given topic or skill. These pupils would have demonstrated their mastery of the material before a jury of knowledgeable teachers. Also, if enough money were available, the same items would be given to certified non-competent pupils who were unable, most of the time, to get them right. This technique is called the contrasting groups method of item validation. If competent new learners using the ISD-produced materials fail certain items they ought to be passing, it is obvious that the instructional method, materials, or both are flawed and need revision.

This activity, reviewing and revising is really stage 7, formative evaluation, and is intimately connected to stage 6. They go together in a reciprocal manner. The MFTP does not operate at all like this. The tests are administered as in a certification examining program. The tests are secure tests. That means strict rules of non-disclosure must be followed. No one except examinees may see the tests either before or after administration. Those with a need to know may look at them in a supervised situation only. Test administration takes place at designated times with safeguards against cheating or stealing of copies of the test questions.

The State claims also the test scores are to serve a diagnostic purpose for the school. The domain scores, sub scores based on what are called content domains, are a product of the test design and scoring procedure. They are the scores obtained on subsets of items in the test that were specified in the item specifications as measures of clusters of different categories of content that contained similar kinds of objectives as decided by content and measurement specialists. So far as one can tell, a score below the predetermined cut score of the domain tells merely that. It fails to point clearly to a necessary and sufficient prescription of pupil or instructional remediation. Without debating the propriety of the term diagnostic, let us say that it will require some sort of magic for a teacher to decide from merely these domain score printouts with no access to actual test items how best to revise instruction. Just what is meant by "the domain of adding whole numbers"? How one should go about improving the individual scores on that subset of items, even though the topic is defined and discussed in the content area instructional guides, is hard to see. The data needed to make an informed judgment of the flaw in the instruction is not available to the teacher or other course designer. For example, two pupils with identical failing domain scores may have gotten them for widely differing reasons (e.g. reading vs mathematic ability).

In the Rasch model literature one can be astounded at the cavalier manner in which the proponents interpret group behavior as "guessing" when an item proves more difficult than some test statistics suggest it should be. The ISD approach requires the team to re-examine both the item and the instructional segment intended to teach that skill or knowledge. If guessing had taken place the designers would have detected it during the formative evaluation and improved instruction accordingly. Some researchers have indicated the positive effects from using Rasch analysis as an aid to improving <u>both</u> instruction and measurement. They find worthwhile the practice of requiring classroom teachers to assess the degree to which pupils performed as they ought to on each item. Where actual performance and teacher expectations differed, the item or instruction or both will be examined and modified to remove this "lack of fit to the model" (Wright & Bell, 1984).

The teacher in a Maryland classroom does know from other sources, however, what pupil deficiencies exist and, if this happens to be a skilled educator, will try to re-teach the particular content. However, such good intentions may turn out to be detrimental because the teacher's guesses might fail, in some number of details, to coincide with the tasks on the MFTP test (Simon, Dec, 1985; Lally, Dec, 1985). Remember the tests are "secure". This could lead to an occasional diploma denial. We have no way of knowing because the system deliberately prevents the instructional delivery section from obtaining the

self-correcting feedback it needs in order to revise instructional flaws. Technical flaws are bound to appear in any instructional program, systematic or even informal ones like the "mother's method" of speech teaching. No system is immune. That is why those methods that make provision for corrective feedback to the instructor are the effective ones and never fall from favor. There is nothing good enough to displace them. The Maryland system, however, deliberately attempts to block vital data on pupil performance from reaching teachers. How on earth are they supposed to "improve" instruction?

As I just said, we won't know how often diplomas will be withheld unjustly. It probably will be rather rare because high school faculty and students are resourceful, intelligent people. They will likely find ways to navigate these hazardous academic waters. But the issue is, why should they spend precious school time playing a contrived game with unevaluated consequences? How well served are the purposes of public education in a modern, sophisticated state such as this by this testing program? Why should pupils, parents, and school staff engage in a contest to pry a passing score for every pupil from the state and the superintendent of schools? The evil is just beginning. Soon, it can be expected, the passing rates on all the multiple choice tests are going to become "too high." This will not happen on the writing test because it is a performance test (Simon 1985). Then, someone will need to establish a quota. That will lead to intrusion of the judiciary to protect victims of more "effective teaching" (that is, as teachers learn the true item specifications and begin to teach those behavioral objectives with more precision pupil's pass rates will rise). Paradoxical, isn't it? If this sounds like an example of the principle of unexpected, undesired outcomes it is.

We will close by pointing out that stages 8 and 9, installing and field testing are obviously neglected in the MFTP and Project Basic model. No instructional system was developed and so nothing exists to install and field test. The MFTP, however, is sometimes described as the driving force in a so-called "measurement-driven curriculum" model of schooling improvement. This descriptor suggests the existence of an instruction control mechanism. One can admire the sentiment but ought to be skeptical about the results.

I believe what I have said here on the subject of how best to improve instruction is correct. Unfortunately, it is very difficult to convince state legislatures. In the introduction to their book, Jaeger and Tittle (1980) claim the North Carolina legislature mandated an educational research before proceeding with a competency testing program. That is most commendable. I hope their testing program is used as the system assessment component in an ISD model. If so, North Carolina will be worth studying. Unfortunately, for the rest of us a competitive market for raising student achievement by the best available scientific means is yet to emerge. Schooling is both precious and costly to the American public. Citizens despise rising taxes. They resent with particularly bad grace paying for an intangible like education when they encounter a poorly trained young store clerk who they learn holds a high school diploma. But the public does value schooling. Every society embraces it in some form at varying levels (Stephens, 1967).

It seems wrong that the talent and energy spent on the MFTP could not have been employed differently. How much better it would be for Maryland youth if

these people were the assessment and evaluation members of a team that was dedicated to producing instructional packages that are guaranteed to produce the specified behaviors implied in the package title. If so, an AERA symposium can appear titled "A state-wide ISD experiment: Trying out an intelligence-driven curriculum model on a large scale."

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